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THE MOUND-BUILDING PRAIRIE ANT.

(*Pogonomyrmex occidentalis.*)

By Geo. A. Dean, Kansas Agricultural College, Manhattan.

Read before the Academy, at Manhattan, November 28, 1903.

OF all the insects none are more familiar to us than ants. They are found in all countries; they establish their communities in the immediate vicinity of many dwellings, and some of them even invade the habitations of man. Their intelligence, industry and perseverance have attracted the attention and admiration of the most serious men. Even in remote ages such men as Solomon did not hesitate to state that these little creatures were worthy of imitation. In Proverbs 6: 6–8, we find the following familiar words: "Go to the ant, thou sluggard; consider her ways, and be wise: which having no guide, overseer, or ruler, provideth her meat in the summer, and gathereth her food in the harvest."

Structurally they rank among the highest of the insects. In efficiency they are second to none. They have acquired the art of living together in societies more perfectly than our own species. Their time and labor are devoted to the welfare of the colony, rather than to that of the individual.

Crossing the prairies of central and western Kansas, the traveler's interest and attention are attracted to the gravel-covered cones which skirt the railroad on either side. Located in the center of a circular cleared space, they stand out very prominently to break the monotony of the grass-covered plains. The industry of these little workers has dotted the prairies with their formicaries. Their mounds are conspicuous along the slopes of a ravine. Their domiciles are located in the little nooks and flats between cliffs and ridges and along the streams. The ants are found persistently clinging to their home in the traveled street and along the crowded sidewalk. They assert their presence in the front yard, at the doorstep, and in the trodden path. They adapt themselves to the abnormal environments of a barn-yard. They cling to their nest, and establish their clearing in the wheat- and alfalfa-fields, regardless of the plowing, disking, and cultivation. The farmer hates them; animals avoid their formicaries; birds and fowls do not molest them. On the other hand, the naturalist admires their industry, wonders at their pertinacity, and enjoys studying their habits.

The form of the mound is usually that of an elliptical cone, although several of them are symmetrical. The cones are of various sizes and heights, depending on the age, size and location of the colony. Of those measured in the grass on the prairies, the prevailing height was about nine inches, while those located in an alfalfa-field, in Ellis county, Kansas (see plate XXIV), were about four inches in height. The mound is made very prominent by the cleared space, by which it is surrounded. This clearing is usually circular in form, although it may be somewhat elliptical. The mound is usually located in the center of the clearing, which is always absolutely void of vegetation. The size of this clearing depends on the size of the mound and the nature of the surrounding vegetation. Those found in the buffalo-grass are much smaller than those in a cultivated field. A large nest may be found with a comparatively small clearing; however, this is not common. The clearings surrounding the nests located in the buffalo-grass averaged nine feet; those in the Russian thistles, eleven feet; those in an alfalfa-field, thirteen to fourteen feet. This clearing is usually smooth and level. These ants, like most mound-building specimens of ants, have a dislike to the presence of vegetation in the immediate vicinity of their mound.

EXTERIOR MEASUREMENTS OF NEST, IN INCHES.

umber.	Height.......	Long slope	Short slope	Major diameter at base	Minor diameter at base	Diameter of cleared space..	Location of mound in cleared space.
1	13	27	24	44	40	126	Center.
2	11	24	24	42	36	90	Center.
3	12	36	24	66	44	168	Center.
4	9	20	20	39	39	132 x 108	West side of clearing.
5	8	36	22	66	43	144	West side of clearing.
6	10	24	24	48	36	108	Center.
7	16	46	34	78	78	144	Center.
8	9	28	16	45	36	120 x 96	Center.
9	9	24	24	44	44	180	Center.
10	8	15	15	24	24	132	Center.
11	9	23	18	44	36	90	Center.
12	9.5	27	27	48	48	132 x 144	Center.
13	11	22	22	52	34	132	Center.
14	11	30	20	51	40	120	Center.
15	9	29	17	48	36	144 x 84	Center.
16	9	27	17	48	38	120 x 96	One foot from edge of clearing.
17	9	21	21	41	41	114 x 96	West side of clearing.

The clearing away of the vegetation is accomplished by the workers cutting it away with their mandibles, which are well adapted for the purpose of such work. We may assume several reasons why the ants wish to have a cleared space, The plants too near the nest would be a hindrance to their going and coming. They would afford a shelter or hiding-place for any enemy or intruder. Vegetation would endanger the nest by the retention of moisture after a rain. The nest would be seriously damaged by the roots of any plants growing near, as the roots would penetrate the underground galleries and chambers. Water, after a rain, would follow down the roots and destroy the nest.

The mounds are covered with any surrounding available material, such as pebbles, gravel, cinders, and dirt pellets. Along the railroads they are covered with cinders, bits of coal and ballast. Many of the mounds on the town site at Wallace, Kan., as illustrated in plates XXV and XXVII, were covered with bits of glass, mortar, nails, etc., this material being available on account of many of the houses having been torn down. True, some of the covering is brought up from below, as they are excavating for the underground galleries and chambers. However, the most of it is gathered out around the nest, as it is of the nature of the surrounding material. The purpose of this gravelly covering is to protect the mound from the outside elements, such as rain and wind. The slope of the mound is usually as steep as the gravelly covering will permit. This covering is from one-half to one inch thick.

It is surprising with what ease these ants will handle the pebbles, which they seize with their outstretched mandibles, and carry over the rough pebbles, to the very summit of the mound without once stopping to rest. Some of the pebbles are at least eight times the weight of the ant carrying them. Yet, with the head elevated, and holding the pebble well to the front, the little worker carries the burden to the desired place, somewhere on the surface of the mound. They work entirely without the assistance of another. Many times a worker, after working hard and long to carry a pebble, finds, on reaching the mound, that the load is too heavy with which to ascend. While she is working away with the pebble at the base of the mound, other ants pass within touching distance, but never stop to assist, or even to ascertain what the trouble is. And thus the disappointed ant must leave the precious pebble at the base of the mound.

Many of the cones have just the single opening, while others have two and three. One exceptionally large one had as many as eight. The position of the gates is usually about one-third of the distance from the base of the mound to the summit. There is no uniformity in regard to the direction of the gates. However, the tendency seems to be to the east, southeast, and south. These gates, which are funnel-shaped openings through the gravelly covering, extend downward a short distance and communicate with the galleries and chambers found in the interior of the mound, and even several feet beneath the mound. The gates are opened and closed every morning and evening, the time varying with the season of the year. In the summer they are usually opened between eight and nine o'clock. They begin closing them a short time before sunset, usually having them closed before darkness comes on. There seems to be only a small force engaged in this work. The material used for closing is the same as that used for the covering of the mound. So perfectly are they closed that even close observation does not detect the place. The gates are also closed if a storm is threatening, the force at work being larger and more active. Especially is this true if the storm is fast approaching. As soon as the gates are opened the working force is out and soon busily engaged with the work. However, they again return to the formicary for their nooning, not coming out to resume their work until the midday fervor of the sun has passed. If the day is a cool, cloudy one, they do not stop for the noon. It does not follow that the ants are not working because the field-work has ceased at the noon hour. The interior work of the nest certainly requires very much time and labor, and this work is probably in operation during the noon hours, and especially in the morning before the gates are opened.

NUMBER, DIRECTION AND POSITION OF GATES.

Number.	No. of gates.	Direction.	Distance from base, inches.
1	1	S.	12
2	1	E.	11
3	1	E.	8
4	1	NE.	7
5	5	N., E., SE., SW., S.	2, 3, 4, 3, 6
6	3	SW., E., N.	6, 4, 5
7	8	N., NW., SW., S., S., SE., E., NE.	8, 6, 14, 16 16, 14, 12, 8
8	3	S., W., SE.	2, 2, 2
9	1	E.	13
10	1	S.	5
11	1	E.	8
12	2	SE., SW.	6, 12
13	2	NE., S.	7, 12
14	2	N., SE.	6, 4
15	1	SE.	8
16	1	E.	9
17	2	N., S.	6, 6

Beneath the gravelly roofing of the mound is the natural soil, of which the remainder of the mound is composed. The most of this has been brought from below, being the soil removed for the underground galleries. This soil is firmly cemented together, forming a hard and almost rain-proof covering. The galleries, into which the gates open, communicate with the galleries, storerooms and living-rooms within the mound and directly beneath the mound. The subterranean galleries and chambers are so numerous in many of the mounds that they are simply honeycombed. This is particularly true in that half of the mound next to the external opening, which is illustrated in plates XXVI and XXVIII. The chambers, with their low, arched ceilings and level floors, are of various sizes, being from one to three inches long, and from one-half to one inch high. The chambers are connected by galleries of various lengths, about three-eighths of an inch in diameter, and, beyond the first three or four inches below the base of the mound, they are not so numerous or close together, many of them here being six inches or more apart. I found these galleries and chambers penetrating the earth to the distance of nine feet. Throughout the entire nest are granaries stored with seeds, many of these storerooms being sealed. Many of the other chambers are nurseries, in which are found the larvæ, pupæ, and young ants. These are probably shifted from one room to another as the surrounding conditions require. The other chambers seem to be merely working-rooms and living-rooms.

Seed of various kinds are gathered upon the field and carried within the nest. The husks or hulls are torn off and carried out, to be deposited to one side of the clearing, while the plump, sound seeds are stored away in the storerooms or granaries. The seeds found in the chambers are those of the surrounding vegetation, excepting, of course, those that are too large for them to handle. The seeds of the common pigweed (*Amaranthus albus*) were found in abundance in nearly all the nests examined. Seeds of the genus *Helianthus* were common in several of the nests. In a millet-field, the ants were busily engaged harvesting the seeds of the millet which surrounded their nest.

Three classes of ants are found within the formicary—the queens, the males, and the working caste (Fig. 11). The queens and males are winged and much larger than the workers. In the nests examined there seemed to be about an equal number of the queens and males. The females are about seven-sixteenths of an inch in length. The color throughout is a yellow brown. They have one pair of small compound eyes and three very small ocelli. The large, black mandibles are armed with seven teeth. All females are provided with a sting.

The males are about three-eighths of an inch in length, being somewhat smaller than the females. The head and thorax are nearly black. The abdomen is brown and more pointed than that of the females. The head, which is small, bears two large compound eyes and three small ocelli, the middle one being much larger than the other two. As with all hymenopterous stinging insects, the males have no sting.

The workers vary from three-sixteenths to five-sixteenths of an inch in length. Their color is a rich chestnut brown throughout. The head is very large, being from two to three times the width of the prothorax. The large, curved mandibles, armed with seven teeth, are well fitted for the purpose of general work, such as seizing, cutting, crushing, and sawing. The head bears no ocelli. The compound

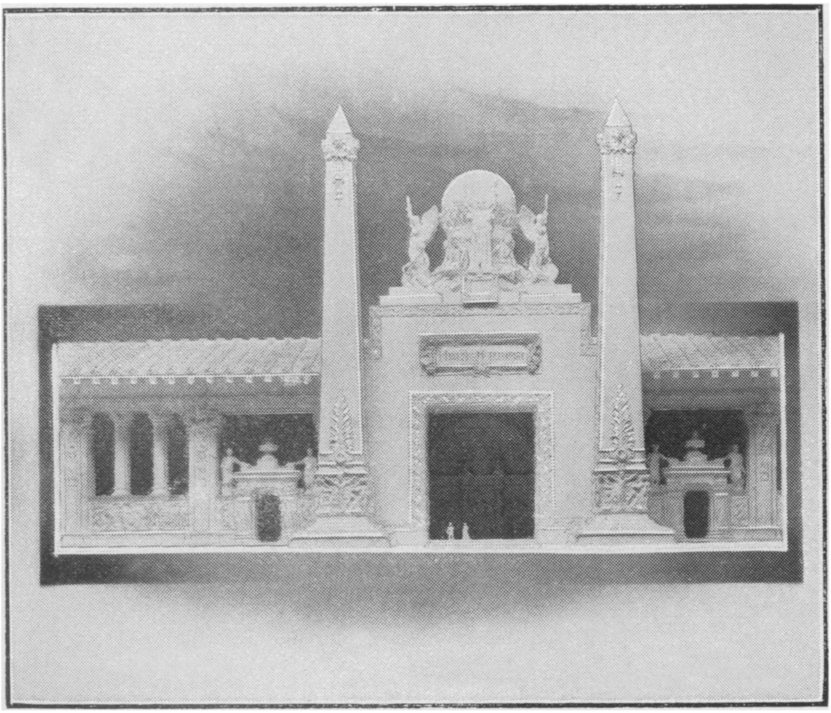

PLATE XX.—Entrance to Mines and Metallurgy Palace, Louisiana Purchase Exposition, St. Louis.

(The Kansas mineral exhibit was installed in this building.)

eyes are small, or about the size of those of the females. The workers are armed with a sting. The workers are very numerous, there being in some of the large nests at least 10,000.

As with other ants, the workers vary in size, and are termed by many writers as the large-headed and the small-headed individuals, the former being called the worker major and the later the worker minor. However, with the *Pogonomyrmex occidentalis* it should be distinctly understood that there is no definite distinction between these. One may select eight or ten of the ants and so place them as to have a gradation from the smaller or worker minor to the larger or worker major. But it certainly is not right to select the two extremes and give them an individual name, when the other eight, coming in between, deserve an equal distinction. There are no characters or division of labor to justify such a distinction.

Although this ant has been endowed by nature with two of the most formidable offensive and defensive weapons known in the insect world—large pointed mandibles for seizing, tearing, and crushing, and a sting that is most painful—and although she is larger than most specimens of ants, yet she is not quarrelsome nor warlike, but on the other hand she is a peaceful and good-natured insect in many respects. This ant permits other species of ants to come on the clearing and establish their nests or erect their little crescent-shaped piles of loose dirt within a few inches of the base of the mound. I have observed as many as ten of these little nests on one clearing. Neither the nests nor the little ants are molested by the occident ant. But, on the other hand, the Occident ant is chased and attacked by

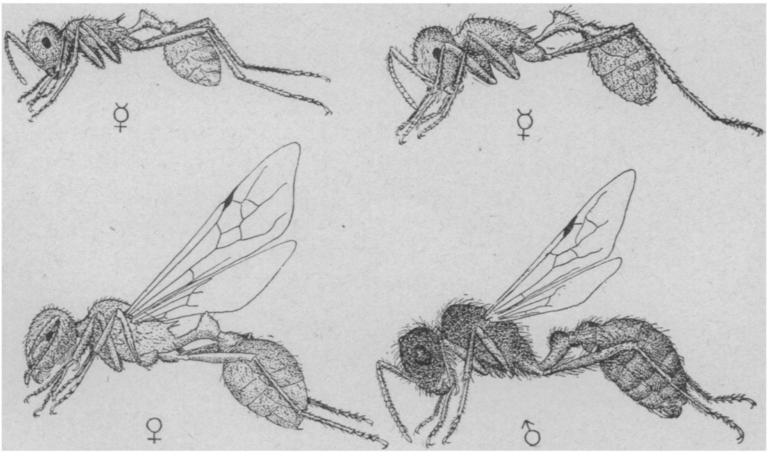

Fig. 11. *Pogonomyrmex occidentalis.* Upper two, workers, minor and major; lower two, female and male. (*Drawn by Ella Weeks.*)

these intruders, if she should happen to pass too near the little one or her nest. Again, I have found our common termites and a species of another ant living within the chambers of the occupied nest. These intruders or parasites were not disturbed or molested by the rightful occupants of the nest. However, when their formicary is molested or seriously endangered by an enemy, they skilfully put to use the warlike weapons with which they are armed, and, if they are fortunate enough to make a landing on a person, and they usually are if you are disturbing them, they bow the head, seize the skin with the mandibles, bow the back, curve the abdomen, and thrust the sting into the tissue.